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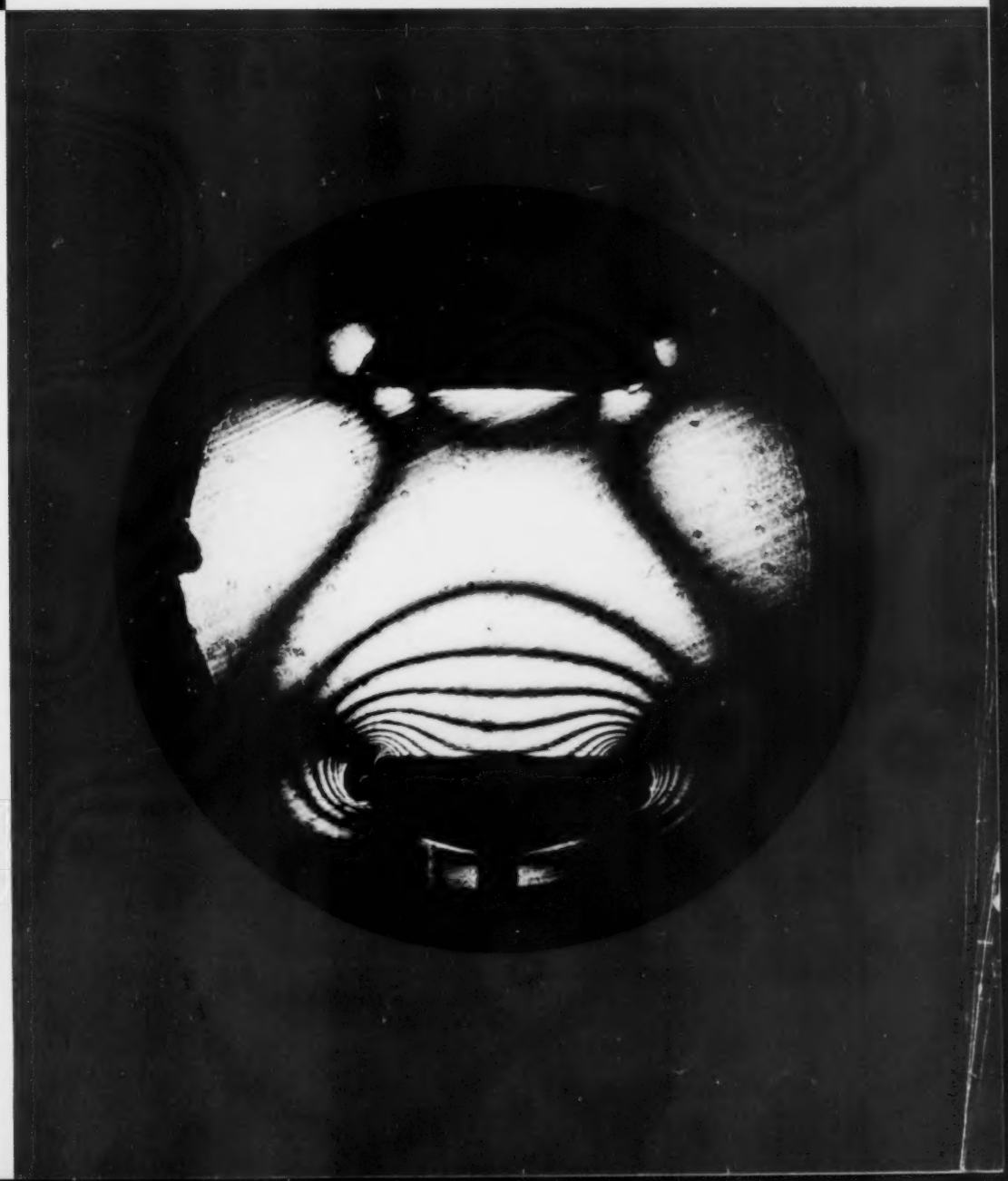
NATIONAL BUREAU OF STANDARDS

Technical News Bulletin



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Technical News Bulletin

MARCH 1970/VOL. 54, NO. 3/ISSUED MONTHLY

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COVER: Laser light passed through a Kerr cell with approximately 65 000 volts applied produced this fringe pattern, which can be used to analyze high intensity electric fields. *(See page 60.)*

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The National Bureau of Standards serves as a focal point in the Federal Government for assuring maximum application of the physical and engineering sciences to the advancement of technology in industry and commerce. For this purpose, the Bureau is organized as follows:

- The Institute for Basic Standards
- The Institute for Materials Research
- The Institute for Applied Technology
- Center for Radiation Research
- Center for Computer Sciences and Technology

The TECHNICAL NEWS BULLETIN is published to keep science and industry informed regarding the technical programs, accomplishments, and activities of NBS.

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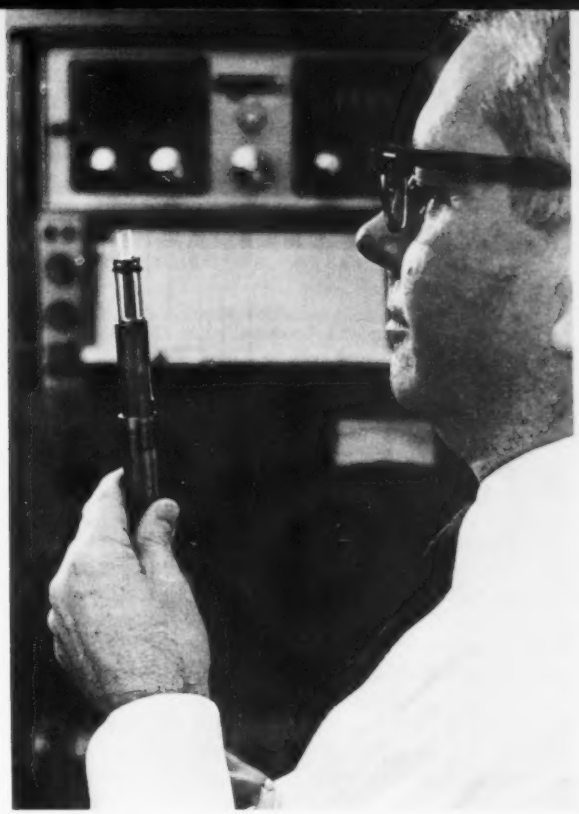


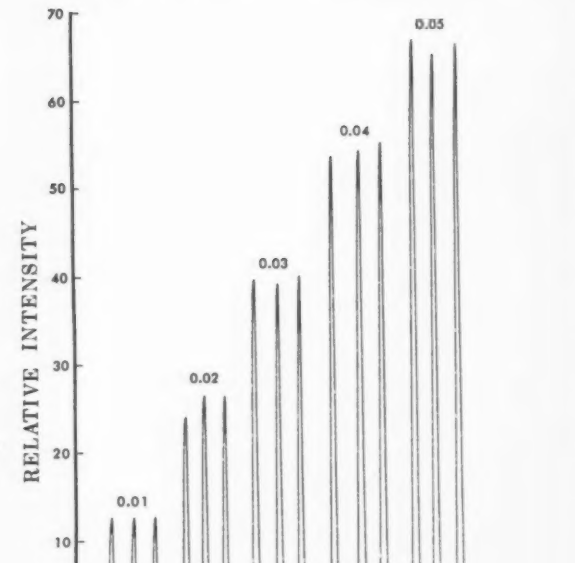
Removed from the flame spectrometer, the optical scanning system that has eliminated the need for a monochromator is held by one of its designers, Theodore Rains.

DERIVATIVE Flame Emission Spectrometry

As a Method of chemical analysis, flame emission spectroscopy provides a precision with few equals among spectrographic methods. However, spectral interference from the matrix often impairs its limits of detection. An atomic line of interest frequently cannot be measured because of interference from some overlapping band structure or from background radiation, such as "noise" of the flame.

A recent development and application at NBS, derivative emission spectrometry, minimizes these interferences so that an element can be detected in the presence of many matrix ions in as small a sample as 50 microliters. The instrumentation was devised by T. C. Rains, K. W. Yee, H. D. Cook, and O. Menis of the NBS Institute for Materials Research, and W. Snelleman of Rijks Universiteit (Utrecht, The Netherlands), who have applied the method to trace determinations of alkali (Li, Na, K, Rb, Cs), alkaline earth (Mg, Ca, Sr, Ba), and many transition elements.[1]

Because many of the alkali and alkaline earth elements are present in the atmosphere and in the human body, the derivative technique has important implications for air pollution and biochemical studies. For example, air pollution researchers are confronted with matrices of complex chemical structures, making it diffi-



Above: Calibration results obtained for lithium in a sodium matrix with the derivative flame emission spectrometry method. The three peaks at each concentration show the precision with which tests may be duplicated.

Right: A closeup of the optical scanner reveals the quartz plate, which when vibrating scans a narrow wavelength region of the flame spectrum.

cult to detect a particular element; in biochemical studies, biological fluids and tissues frequently are available only in microliter quantities. Combined with the ability of flame spectrometry to provide rapid analysis, the application of derivative spectrometry to micro samples and to complex matrices makes this a valuable technique.

A newly designed optical system incorporating a vibrating quartz plate provides a rapid, repetitive scan of a narrow wavelength region of a spectrum, minimizing the need for a monochromator of high resolving power. This scan is synchronized to an ac amplifier that is tuned to twice the frequency of the vibrating quartz plate, whereby the second derivative of the output signal is obtained. Weak spectral lines then can be measured without interference from background radiation or broad band spectra.

Another unique feature is the small amount of sample required for analysis. Generally, several milliliters of solution are needed for a wavelength scan of the base line and the peak height; however, using the peak of a line with the optical scan and then measuring the second derivative of the output signal, only a fraction of a milliliter of solution is required. A typical application was the determination of lithium in a sodium matrix using only 50 μl of solution.

This new system produces a relative standard deviation of 0.5 percent for a single scan for lithium. Other elements can be determined with about 1 percent relative standard deviation. This compares favorably with the 1 to 5 percent relative standard deviation attained by other flame emission methods.

[1] Snelleman, W., Rains, T. C., Yee, K. W., Cook, H. D., and Menis, O., Application of derivative flame emission spectrometry for matrix problems and micro samples, Anal. Chem. (in press).

1969 MEETING OF THE INTERNATIONAL COMMITTEE FOR WEIGHTS AND MEASURES

ACTIONS TAKEN BY THE INTERNATIONAL COMMITTEE FOR WEIGHTS AND MEASURES (CIPM)* may lead to the addition of the mole to the International System of Units, and expansion of the International Bureau of Weights and Measures into the field of standard reference materials. These and other proposals were discussed at the 1969 CIPM meeting.

Prior to the meeting, Dr. L. M. Branscomb, successor to Dr. A. V. Astin as Director of the National Bureau of Standards, was elected by CIPM to suceed Dr. Astin as a Member of that body. Dr. Astin remains an Honorary Member of CIPM, free to attend all CIPM meetings.

The CIPM, composed of 18 individuals, each from a different country, is responsible for the operation of the International Bureau of Weights and Measures, and, through its seven consultative committees, proposes to the General Conference on Weights and Measures (CGPM)** measures for consideration by that body. (Each nation adhering to the Treaty of the Meter is represented at CGPM meetings.)

At the 1969 CIPM meeting held in Paris, France, October 7–9, the committee accepted, and will submit to the CGPM for approval at the 1971 meeting, several actions of the Advisory Committee on Units (CCU).*** One of the CCU proposals is that a seventh base unit, the mole, be added to the International System of Units. A translation† of the text is:

1. The mole is the amount of substance in a system containing as many elementary entities as there are atoms in 0.012 kilogram of carbon 12; its symbol is mol.

2. When one uses the mole, the elementary entities ought to be specified and can be atoms, molecules, ions, electrons, other particles, or specified groups of such particles.

3. The mole is a base unit of the International System of Units.

Also recommended by the CCU were actions to add to SI the name siemens, symbol S, for the unit of conductance, and the pascal, symbol Pa, as a short name for the newton per square meter (unit of pressure and stress). The CIPM also adopted a recommendation clarifying the meanings of the terms "SI Units" and "SI Prefixes," and recommending the use of SI Units and their decimal multiples and submultiples whose names are formed by means of SI Prefixes.

*CIPM = Comité International des Poids et Mesures
**CGPM = Conference Générale des Poids et Mesures
***CCU = Comité Consultatif des Unités
†As an authorized translation of this resolution has not as yet been issued, this version must be regarded as an interim translation.

CIPM recognized the need for greater international cooperation in the field of standard reference materials (SRMs). SRMs, materials of known physical property or chemical composition, are widely used for on-site calibration of instrumentation. Better coordination of the various national SRM programs could help prevent costly, time-consuming duplication of standards, and would, ideally, encourage laboratories having special competence to serve as a source of SRMs in that area. CIPM made a modest beginning in the SRM field. A preparatory committee was established for the initiation of an SRM program; this committee is expected to recommend the formation of a consultative committee on SRMs, and the addition of 1–2 staff members of BIPM to coordinate interchange of reference materials involved in the basic standards.††

It is impossible to specify the time of day as accurately as time interval—the second—is defined and realized. Therefore, CIPM also agreed to take a hard look at the requirements for epoch and simultaneity. The basic problem is to define a unified time scale that meets the requirement not only of physicists and engineers but also of navigators and astronomers. Close relationships between the International Bureau of Weights and Measures and the International Time Bureau can be anticipated.

Another action of CIPM was to agree to add its name to the list of cosponsors of the International Conference on Precision Measurement and Fundamental Constants. The objective of this Conference, to be held at NBS in August 1970, is to discuss modern techniques of precision measurement and their application, along with modern theoretical developments, to the determination of the fundamental constants.

The National Bureau of Standards is represented, by appropriate experts, on each of the seven Advisory Committees of the CIPM. The Bureau's technical competence in the past has been, and surely again in the future will be, a factor in the development and adoption of new defining standards for the base units of SI. An example of current work along these lines is the methane-stabilized He-Ne laser developed at the Boulder, Colo., Laboratories.[1] This laser, reproducible to within a part in 10^{11} is a likely candidate to succeed Kr 86 as the present standard of length.

††In the United States, the National Bureau of Standards prepares and distributes over 600 different SRMs; 25 percent of the income results from sales to other countries.

[1] Barger, R. L., and Hall, J. L., Pressure shift and broadening of methane line at 3.39 microns studied by laser-saturated molecular absorption, Phys. Rev. Letters 22, No. 1 (Jan. 1969). See also New laser technique gives precise length measurement, Nat. Bur. Stand. (U.S.), Tech. News Bull. 53 (3) 60 (1969).

Hazardous Product PRODUCED BY ELECTRICAL INSULATION

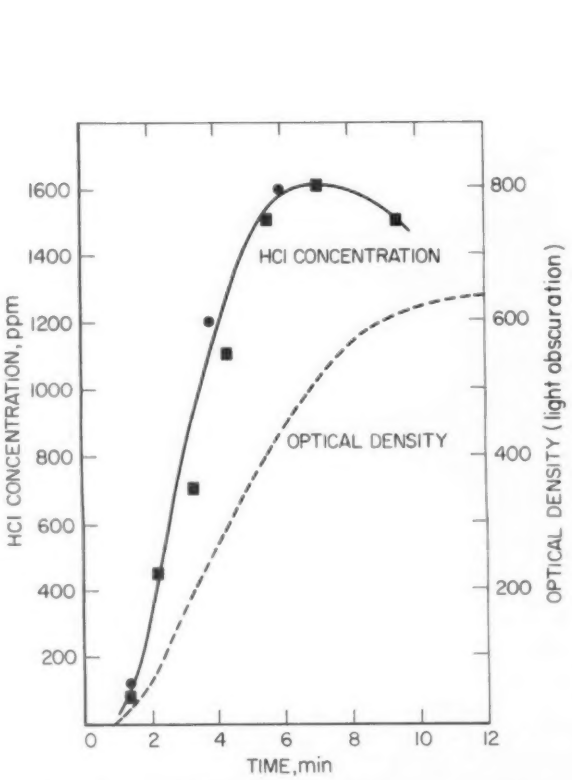
A RECENT STUDY at the NBS Building Research Division has shown that when polyvinyl chloride (PVC) wire insulation is heated it goes through two stages of decomposition. In the initial stage, when the level of heat input is relatively low, a white HCl mist is generated. In the latter phase, when the material is exposed to higher levels of heat input or an open flame, a dark sooty smoke is released.

The release of the HCl prior to the development of dense smoke presents a potentially hazardous situation, especially to fire-fighting personnel. The HCl in this state is colorless, but forms a white mist resembling steam by combining with moisture in the air. Although innocuous in appearance, the HCl acts as a primary irritant and corrosive agent to the respiratory system.

The decomposition phases of PVC are a function of the temperature of the material. Gaseous hydrogen chloride is released from PVC when the temperature reaches about 450 °F. The rate of release depends upon the temperature and density of the material. The gas, on exposure to moisture in the air, forms white fumes of acid vapor by absorption of moisture. The vapor is very reactive and can be easily adsorbed on contact with a surface. If the temperature is maintained below 650 °F, dark smoke or soot will not form. Above 650 °F, carbonaceous degradation products in the form of black smoke are present.

In the NBS study a specimen of an electric cable covered by black plastic insulation, composed mainly of PVC with some amounts of fillers and plasticizers, was tested. The insulation was cut and flattened to fit in the standard holder in a smoke density chamber.[1] The specimens were irradiated with 2.5 watts/cm^2 heat energy for non-flaming exposure tests.

Results were obtained in terms of optical density and quantity of HCl concentration. In the 18 cu ft chamber, the combustion products from a 6.5 sq in sample reached a HCl concentration of above 1600 ppm. From 1000–2000 ppm of HCl is considered to be dangerous on short exposure,[2] whereas 5000 to 10 000 ppm of carbon monoxide are needed for comparable effect. Fire-fighting personnel should thus be alert to the possible dangers of electrical insulation decomposition in a fire situation.



HCl concentration and optical density of PVC electrical insulation decomposition products.

[1] Gross, D., Loftus, J. J., and Robertson, A. F., **Method for Measuring Smoke from Burning Materials**, ASTM STP No. 422 (1966).
[2] Henderson and Haggard, **Noxious Gases**, Reinhold Publishing Co.

TESTING PROGRAM ON VULCANIZED RUBBERS ESTABLISHED

To Reduce Interlaboratory Variability in testing rubber, the Bureau has established a collaborative program for rubber testing laboratories. As the result of a survey by NBS and American Society for Testing and Materials (ASTM) Committees D-11 on Rubber and D-24 on Carbon Black, the program will include tests for tensile strength, ultimate elongation, and tensile stress of vulcanized rubbers. Tests of carbon blacks and raw rubbers may be added at a later time.

In this program, NBS distributes samples to the participating laboratories and provides an analysis of test results. Two standard ASTM sheets of each of two vulcanized rubbers are distributed bimonthly to the subscriber. From each sheet the subscriber cuts five specimens, on which he determines the tensile strength, ultimate elongation, and tensile stress at 300 percent elongation in accordance with ASTM D412, Tension Testing of Vulcanized Rubber. The subscriber, identified only by code number, records his values for each specimen and submits his results to NBS.

Having analyzed all test results, NBS prepares a report for return to the participants before the next distribution of rubber samples. The report includes test data, averages, and standard deviations for individual laboratories and for the group as a whole. Information is provided in such a manner that an individual laboratory may readily determine the level and variability of its results in comparison with the NBS values and with those of other participating laboratories. A summary report is distributed at the end of each year, together with recommendations for modifications or additions to the program.

Further information on the vulcanized rubber program may be obtained from Robert D. Stiehler, Room B360, Polymers Building, National Bureau of Standards, Washington, D.C. 20234.

NOTE: In addition to the vulcanized rubber program, NBS administers testing programs on such products as paper, bituminous asphalt, concrete, and cement. NBS collaboration with private, industrial, and government testing laboratories in these programs provides a basis for improved quality control.

CHANGES IN THE U.S. UNIT OF LUMINOUS FLUX

The Bureau announces a change of 1.9 percent in the U.S. unit of total luminous flux for gas-filled tungsten-filament lamps. This change is necessary to bring the U.S. unit into agreement with the world mean. Owners of gas-filled tungsten-filament lamp standards of luminous flux supplied on the old basis should multiply the presently assigned values by the factor 1.019 to obtain values on the new basis.

Several international intercomparisons [1-4] of luminous flux measurements have been conducted since the establishment of the platinum-point black body [5] as the primary standard of luminous intensity. These intercomparisons indicated that the U.S. unit of total luminous flux at the color temperature of gas-filled tungsten-filament lamps (approx. 2800 K), maintained at NBS, is discrepant with respect to the world mean. Recent work at NBS has confirmed that this discrepancy represents a misassignment of the U.S. unit.

In the past 30 years NBS has set up standards of total luminous flux for several categories of gas-discharge lamps. These standards have not been referenced to the gas-filled tungsten lamp standards of luminous flux, but rather have been calibrated by the more fundamental method of distribution photometry based on the NBS standards of horizontal luminous intensity. Since no change is indicated for the other U.S. photometric units, flux standards derived directly from standards of luminous intensity will not change. Lamps falling specifically in this category for which no change in rated values is necessary include mercury vapor [6] and fluorescent lamps.

[1] Comité Consultatif de Photométrie, Session de 1952, Procés-Verbaux des Séances, Annexe P3, 46–75.
[2] Ibid, Annexe P4, 76–100.
[3] Comité Consultatif de Photométrie, 4e Session (1957), Procés-Verbaux des Séances, Annexe P8, 74–103.
[4] Comité Consultatif de Photométrie, 5e Session (1962), Annexe 9, 63–87.
[5] Announcement of changes in electrical and photometric units, Nat. Bur. Stand. (U.S.), Circ. C459, 12 pages, (May 1947).
[6] Nat. Bur. Stand. (U.S.), Tech. News Bull. **35** (1) 3–5 (1951).

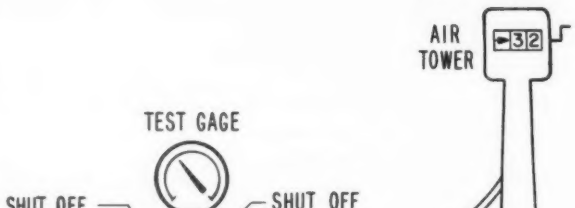
ENGINEERS SURVEY AIR TOWER ACCURACY

ENGINEERS STUDYING TIRE WEAR AND SAFETY at the NBS Institute for Applied Technology recently measured the accuracy of tire inflation equipment at 50 service stations. Such a study was needed because station air towers are almost never tested, once installed, despite the importance of maintaining correct inflation pressures. This survey was performed by the Institute's Office of Vehicle Systems Research as part of its research for the Department of Transportation. OVSR engineers Bert Simson and Richard Radlinski found air tower errors to be so great that there is a 45 percent chance that tire inflation will differ by at least 3 psi from the pressure the tower is set for.[1]

The pressure to which automotive tires should be inflated is specified by the vehicle manufacturer for various loads. Inflating tires to these pressures reduces the likelihood of tire failure and results in the best compromise between long tread life and good ride quality. Underinflation by only 5 psi can significantly reduce tread wear, impair handling, and lead to tire failure.

To find out how accurate air tower settings are and to assay the threat to safety and tire life posed by tower error, NBS tire systems engineers conducted a brief survey. Using a random sample of 50 service stations in the Maryland suburbs north of the District of Columbia, they measured pressures by inflating a spare tire, to which an accurate pressure gage* and a release valve were permanently connected, and recorded the tower pressure setting and the actual pressure. The nominal pressures used were 20, 24, 28, 32, and 36 psi; all five were used at each station, but in randomized order.

Bert Simson adjusts an air tower at the NBS service area as Richard Radlinski prepares to measure the pressure delivered at a setting of 36 psi.



Apparatus for measuring the accuracy of air tower pressure settings.

The distribution of the deviations of delivered pressure from the pressure setting was found to have a standard deviation of 4 psi. A motorist using air towers like those tested would have only one chance in five of inflating a tire to within 1 psi of the desired pressure. On the other hand, he is likely to get larger deviations according to the following table:

Pressure Deviation	*Probability (%)*
±2 psi or more	62
±3 psi or more	45
±4 psi or more	32

Since most of the errors found could be reduced by periodic calibration and adjustment of the air tower, this is recommended for consideration by service station operators, wholesalers (who service much station equipment), and local authorities. In the absence of such a program, however, the individual car owner can greatly improve inflation pressure accuracy by using his own tire gage to check the air tower setting. Personal pressure gages are inexpensive and some of them are reported to be accurate to within 1 psi,[2] if not abused.

*The test gage used was a 0-60-psi model, calibrated at the beginning and end of each day's testing against a master gage at the Bureau.

[1] Simson, B. G., and Radlinski, R. W., **The accuracy of air tower pressure gages in suburban Washington, D.C.**, NBS Tech. Note 512 (Jan. 1970), available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, for 25 cents. Order by SD Catalog No. C13.46:512.

[2] **Automobile tire gauges**, Consumer Reports **33**, 94–96 (Feb. 1968).

FIPS NOTES

In the fall of 1965 the Secretary of Commerce established the NBS Center for Computer Sciences and Technology to carry out the Secretary's responsibilities under the Brooks Bill (Public Law 89–306, passed October 30, 1965). The Center, under the direction of H. R. J. Grosch, provides leadership and coordination for government efforts in the development of voluntary commercial information processing standards, develops recommendations for Federal information research and analysis, and provides scientific and technical support and consultative assistance in the field of computers and information processing to Federal agencies. These Notes will cover information-processing standards activities in the Federal Government, particularly those of the Center.

INDUSTRY REFERENCE DISK RECEIVED

Charles A. Phillips, Chairman of American National Standards Institute Committee X3, Computers and Information Processing, delivered to Joseph O. Harrison, Jr., Chief, Office of Information Processing Standards on January 28, 1970, the first of several candidate magnetic disk reference surfaces.

NBS and interested ANSI Subcommittee X3.2.7 industry members have agreed to the establishment of a national amplitude reference disk standard. Acceptable output levels for the single disk and disk pack have been proposed based on current industry standards. This first candidate reference disk from industry was provided to the X3 Committee by the International Business Machines Corporation.

The magnetics standards effort will be enhanced by the future joint efforts of NBS and industry in the establishment of a single measurement system and national amplitude reference disk standard. Still to be resolved are the performance requirements directly related to the measurement techniques.

Charles A. Phillips, ANSI (right), presents Joseph O. Harrison, Jr., NBS (left), with the first candidate of an amplitude reference disk while Philip S. Johnson, NBS and Chairman of ANSI Subcommittee X3.2.7, Disk Packs, watches.

HUMAN FACTOR IN DATA CODES

Data codes are symbolic representations of facts and concepts recorded, processed, stored, communicated, and displayed in information processing systems. Specifically, they identify and describe persons, places, organizations, things, ideas, and actions. A data coding system is a coded language system that facilitates the processing and handling of information by computers or other automated devices. In the past, and to a large extent even now, data codes have been developed with primary attention given to machine processes. Little, if any, attention has been given to the human aspects of data code development. The assumption has been that humans can adjust to the use of codes and can record and transcribe data with equal or better accuracy than the machines.

As computers and transmission equipment become more and more reliable, it becomes obvious that data entered accurately into the equipment is processed and communicated accurately. However, many systems continue to produce unreliable information, even after thorough debugging of programs and equipment. Inaccurate data bases and inputs are identified as the culprits.

Analysis of the causes of errors soon proved that humans do *not* record, process, and transfer strings of characters with the same efficiency and reliability as do the machines. This fact has resulted in much research to examine the human capability to deal with coded data. Such research has produced several startling facts that have resulted in new conclusions and hypotheses. Further research is being conducted to substantiate these findings.

Early results are already being considered as fundamental coding principles by systems designers and those involved in data standardization. The following are some of the more significant findings:

1. Data errors are of two basic types: random errors that have no real pattern of occurrence and systematic

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errors that occur with some degree of regularity and predicability. Random errors cannot be avoided or eliminated. Systematic errors, to the extent that they can be detected, should be identified; and factors that contribute to their occurrence should be accounted for in the design of data codes.

2. In all cases, the development of data codes for a particular class of subjects should begin with the following questions:

a. What uses are to be made or are anticipated of the codes?

b. Are codes really needed, and if so why?

c. What and how many items are to be included in the class of subjects to be coded?

d. What is the most effective code structure? What rules or procedures are necessary for making code assignments?

In answering these questions, certain basic information needs to be collected. This includes seeking answers to further questions:

a. Will the user of the information produced by the system accept data codes on the output document?

b. How critical is the coded data to the system? What are tolerable error rates? Should a check character be employed to reduce errors?

c. How will the data codes be maintained?

d. Are there other codes currently in wide use that are acceptable?

e. What are the machine factors to be considered? (e.g., computer processing and storage capabilities, input media and method of recording—i.e., punched cards, punched paper tape, magnetic tape, on-line terminals, optical read forms—and transmission time.)

f. How and by whom are the data collected or obtained?

g. What human factors (limitations and capabilities) need to be considered?

These factors are not listed in any particular order of significance. Trade-offs usually are necessary before final decisions are made because not all factors can be satisfied.

3. Errors increase as the number of characters in the data code (code length) increases. Longer codes should be divided into smaller units of three or four characters to increase reliability of recording, e.g., 123-456 instead of 123456 or ABC-DEFG instead of ABCDEFG.

4. A method has been developed to predict code-use difficulty. This method, which is called the "Information Load Method," takes into account the length of the code and the structure of each character in the code. The "information load" of a given code is defined as the sum of the "character load" of each character of the code. The character load is a value equal to $\log_2$ of the total number of different characters that could appear in that character position. For example, the character load for a numeric character code position that could have values of 0 through 9 is the $\log_2$ of 10, or 3.32, and for an alpha character position where the values could range from A through Z, the character load is the $\log_2$ of 26, or 4.70. The information load of a three-character numeric code would thus be: 3.32+3.32+3.32, or 9.96. For a three character alpha code, the information load would be: 4.70+4.70+4.70, or 14.10. A code having two numeric characters and one alpha character would have an information load of: 3.32+3.32+4.70, or 11.34.

This technique is most usefully applied to nonsignificant codes where no secondary meaning can be derived from the code. Nonsignificant codes are used only to uniquely identify the coded subjects in the class. For example, the number 80 would be a nonsignificant code for the month of December, whereas 12 would be a significant code since December is the twelfth month of the year.

When longer codes are broken into smaller units, the information load applies to the smaller units. Whenever the information load exceeds 20, the error rate of data recording can be expected to increase. The number 20 has been determined through laboratory studies.[1]

5. The characters used in data codes should be those that are in common use. Avoid special symbols such as Greek letters and diacritical marks. Only one case of the alphabet should be used, i.e., ABCD or abcd, not AbCd.

6. In cases where the code is structured of both alpha and numeric characters, similar character types should be grouped and not dispersed throughout the code. For example, fewer errors occur in a three character code where the structure is alpha-alpha-numeric (i.e., HW5) than in the sequence alpha-numeric-alpha (i.e., H5W).[2]

7. Significant or meaningful data codes are preferred over nonsignificant or random codes. This facilitates recall by the human coder and reduces errors. For example, in coding the counties of the States of the United States, fewer errors may be expected when the code structure is SSCCC—where the first two characters are the code for a State and the last three characters are the code for a county within that State—than in a code such as XXXX that is randomly assigned to each county.

In this connection, mnemonic data codes are less error producing than other types of codes where the number of items to be coded is small. For example, M and F are more reliable codes for male and female than 1 and 2. Y and N are preferred for Yes and No over 1 and 2.

8. When it is necessary to use an alphanumeric random code structure, characters that are easily perceived as, or confused with, other characters should be avoided. Some examples are: letter I vs. number 1; letter O vs. number zero; letter Z vs. number 2; slash, or virgule, / vs. number 1; and letters O and Q.

9. Nonsignificant codes should avoid characters that when pronounced sound alike (acoustically homogeneous); for example, the letters B, C, D, G, P, and T or the letters M and N.

10. The rules of the data code structure and its derivation should be clearly stated and consistently applied. For

example, a mnemonic code may be formed by deleting all vowels from the names of the coded items as DT for date or GRN for green, or the first letters of the words of the coded items may be used as EOF for End of File or DO for Due Out.

These findings and principles result in the conclusion that more attention must be given to the coding and representation of data than has been in the past. Some of the limitations that have been imposed on data coding to facilitate machine operations, such as the "tight" coding on many 80 column punched cards, need to be reevaluated to obtain more reliable data inputs. It must be recognized in systems design that there must be a proper balance of the components in the system (men, procedures, data, and machines). The strengths and weaknesses of each component must be considered. Where trade-offs are necessary, the human element should be given preference over the machines.

ISO RECOMMENDATIONS FOR WRITING DATES AND NUMBERING WEEKS

At a special meeting of the DATCO Committee of the International Organization for Standardization (ISO) in Geneva, Switzerland, October 8, 1969, two draft ISO recommendations were developed for the "Writing of Calendar Dates in All-Numerical Form" and "Numbering of Weeks." Delegates attended from France, Germany, Italy, Sweden, Switzerland, the United States, and the United Kingdom; George W. Frey, Mellon National Bank of Pittsburgh, was the United States Delegate. Also represented were ISO Technical Committees 95, Office Machines, and 97, Computers and Information Processing; Harry S. White, Jr., NBS Center for Computer Sciences and Technology, represented TC 97.

The draft recommendation for "Writing of Calendar Dates in All-Numerical Form" is intended to remedy the difficulty that now exists when such dates are written. March 15, 1970, now appears as 03-15-70, 15-03-70, and 70-03-15. It was recognized that this situation created considerable confusion in documents involving international traffic and exchange. It was recognized that this confusion did not arise when the month was spelled out or abbreviated. The most logical order of the time elements—year, month, day—provides advantages in filing and classification and in applications where arithmetic calculations of dates are necessary. Thus, the following rules have been proposed:

1. An all-numerical date should be written in the following descending order: year-month-day.

2. An all-numerical date should be exclusively expressed in Arabic numerals.

3. An all-numerical date should consist of:

a. Four digits to represent the year. Two digits may be used where no possible confusion can arise—4 digits are especially recommended to clearly indicate that the descending order is being followed.

b. Two digits to represent the month.

c. Two digits to represent the day of the month.

4. An all-numerical date should be written with a hyphen as a separator between year and month and between month and day of month; for instance, July 1, 1969, in all-numerical form would be 1969-07-01.

The calendar week is a convenient unit for certain commercial and planning purposes. Delivery dates in purchasing contracts, transport plans, and similar documents are often designated by week number. Here again, several different methods for determining the first week of the year exist in various countries. Also, it was recognized that the standardization of the first day of the week (Sunday or Monday) has religious and historical overtones. Thus the proposal for "Numbering of Weeks" is applicable in business or commercial use only. This draft proposal has the following rules:

1. A week number should always stand for a time unit of seven days.

2. The time unit of a week should always begin on Monday as the first day of a week.

3. The first week of a year is the week containing four days or more of the new year.

4. The form of writing the week number will be dependent on the context of its application:

a. For the purpose of data processing, the week numbers will be recorded as two digits, 01 through 53. For purposes of clarification, the last digit of the year may precede the week number—901 being the first week of the year 1969.

b. Calendar publishers will not normally print a zero in front of the week numbers 1 to 9, but data processing applications would record these as 01 to 09.

c. To clearly indicate the reference to a week number it may be necessary to add a symbol for "week" to the week number—W01 or W1 for the first week of the year.

d. In legal documents or contracts the week number should be written as two digits to avoid the possibility of falsification.

These two draft recommendations will be forwarded to the ISO member bodies [3] in the near future for consideration. The American National Standards Institute will act as the focal point for obtaining comments from interested U.S. organizations.

Those organizations or persons interested in commenting on the proposed recommendations may obtain copies from the American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018, Attention: Mr. M. F. Killian.

[1] Cardozo, B. L., and Leopold, F. F., Human code transmission, Ergonomics **6**, 133–141 (1963).

[2] Owsowitz, S., and Sweetland, A., **Factors Affecting Coding Errors**, The Rand Corporation, Santa Monica, Calif., Apr. 1965.

[3] **International Standards for Information Processing**, FIPS Notes, Nat. Bur. Stand. (U.S.), Tech. News Bull. **54** (2) (Feb. 1970).

Expanded Laser Beam

USED TO ANALYZE HIGH INTENSITY ELECTRIC FIELDS

W. A. Bagley alines a laser while E. C. Cassidy positions a polarizer in an experiment to analyze the high-intensity electric field between the electrodes of a Kerr cell.

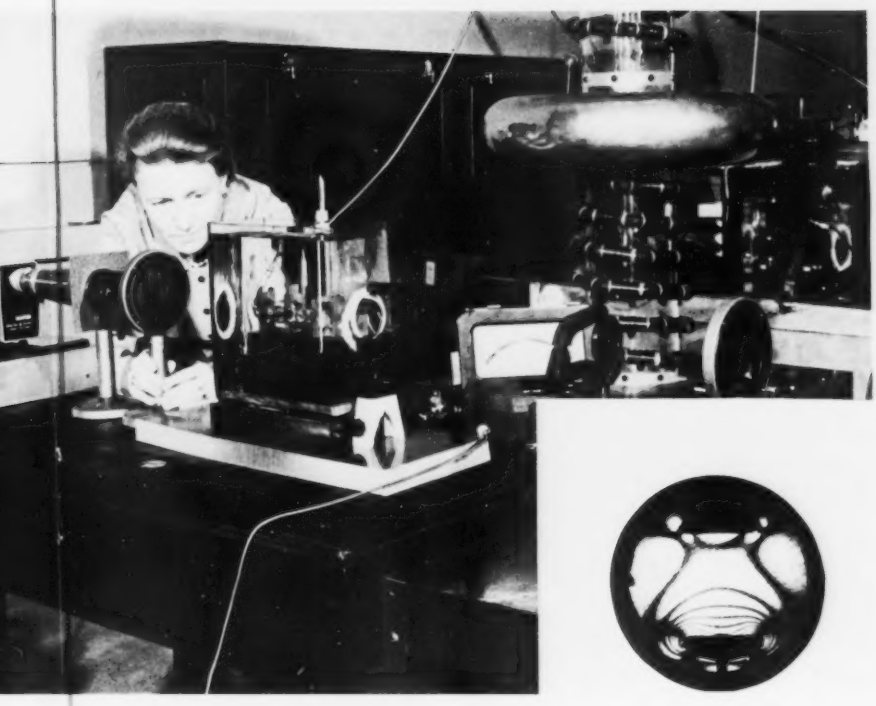
IN THE KERR EFFECT, a cell containing two electrodes immersed in a dielectric liquid is installed between two polarizers oriented so that they will not transmit light. When a sufficiently high voltage is applied across the electrodes, the polarization of the light is altered by the imposed electrostatic field and light is transmitted. The effect is used for high-speed optical shutters, studies of dielectric liquids, and measurement of high voltage pulses of short duration.[1]

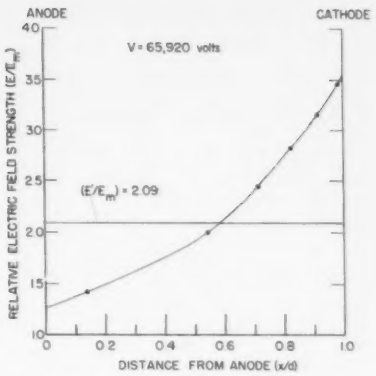
In recent work, E. C. Cassidy and H. N. Cones of the NBS Institute for Basic Standards devised a technique utilizing the Kerr effect for experimental observation of the profile of distorted electrostatic fields between electrodes immersed in nitrobenzene.[2] The field is mapped directly by fringe patterns produced by the Kerr effect when high direct voltages are applied across the electrodes.

This technique, which was developed to permit calibrations of Kerr pulse measuring systems, offers several advantages over conventional field-mapping methods, including the following: two-dimensional visual images, similar to those achieved in photoelastic mechanical stress analysis, permit direct observation of the field distribution, thereby enabling immediate detection of regions of high electrical stress where arcing and breakdown are more likely to occur; space-resolved measurements of field strength and potential are obtained from a single photograph; measurement resolution increases with the magnitude of the field; and a laser source allows simplicity in the optical system.

Though the observations must be made in materials having reasonably high Kerr constants and dielectric strengths, it is anticipated that their use for electrical stress analyses and breakdown studies may lead to a better general understanding of the behavior of many dielectrics in the presence of high-intensity electric fields. Such observations should be particularly useful in studies of liquid dielectrics where complex distortions of the field due to the presence of free charge or ions make analytical determination of the field distribution extremely difficult, if not impossible.

In the NBS apparatus, which was developed with partial support from the Atomic Energy Commission through the Sandia Corporation (Albuquerque, N.M.), an expanded (50 mm diameter) helium-neon laser beam is passed through a polarizer oriented so that light entering a nitrobenzene-filled vessel (Kerr cell) is linearly polarized at an angle of 45° with respect to the inner surfaces of immersed parallel electrodes. The beam is directed between and along the length of the electrodes to a second polarizer, "crossed" with respect to the first, so that initially no light is transmitted by the system. When voltage of sufficient magnitude is applied across the Kerr cell, which is submerged in insulating oil to prevent electrical breakdown over its exterior surface, the imposed electric field induces birefringence in the nitrobenzene. Thus, the state of polarization of the light passing between the electrodes is altered by the field, and light is transmitted through the system. As





Upper: Fringes produced by applying 66 000 volts to a nitrobenzene-filled Kerr cell.

Lower: Relative field strength between the electrodes of a Kerr cell filled with nitrobenzene with 65 920 volts applied is shown as a function of normalized distance from the anode.

the voltage is increased, the light transmitted by the second polarizer oscillates between maximum and minimum intensity levels (numbered n) in response to the increasing magnitude of the electric field.

If the field between the electrodes is uniform, the light intensity will change uniformly over the interelectrode area. However, if the interelectrode field is nonuniform, as is often the case in dielectric liquids, the transmitted light intensity will vary over the interelectrode area according to the average local field strength along each light path through the liquid. When sufficient voltage is applied, photographs of the transmitted light reveal alternate bright and dark fringes, corresponding to the maximum and minimum transmission levels, which map the distorted field profile directly. Regions of greatest distortion and highest electrical stress are detected at a glance from the fringe pattern.

In addition to visual observations, analysis of the field distribution from measurements of the fringe positions enables space-resolved determinations of relative field strength, field direction, actual field strength (in V/cm), and potential.[3] The Kerr constant of the liquid may also be derived.

The relative strength (E/E_m) of the electric field along the equifield lines delineated by the brightest and darkest points of each bright ($n=1, 3, 5\ldots$) and dark ($n=2, 4, 6\ldots$) fringe is determined as follows:

$$(E/E_m) = \sqrt{n}$$

where E is the magnitude of the imposed local field and E_m is the field strength that produces the first transmission maximum in the liquid under study.

If the voltage is high enough to produce several dark fringes in the interelectrode area, the relative field strength, averaged along the length of the light path in the field, may be plotted as a function of distance from one of the electrodes by measurement of the fringe positions. The average relative field strength E'/E_m imposed between the electrodes is then easily calculated from the plotted field distribution, and the voltage required to produce the first transmission maximum in a given cell under uniform field conditions is derived. This voltage, called the cell constant, is needed to calibrate the system for short ($\sim 10\,\mu s$) pulse measurements.[1]

[1] Cassidy, E. C., Cones, H. N., Wunsch, D. C., and Booker, S. R., **Calibration of a Kerr cell system for high voltage pulse measurement,** IEEE Trans. on Instr. and Meas. **IM-17,** 313-320 (1968).

[2] Cassidy, E. C., and Cones, H. N., **A Kerr electro-optical technique for observation and analysis of high-intensity electric fields,** J. Res. Nat. Bur. Stand. (U.S.) **73C** (1&2) **5-14** (1969).

[3] Cassidy, E. C., and Cones, H. N., **Electro-optical observations and measurements of distorted high intensity electric fields,** 1969 Annual Report: Conference on Electrical Insulation and Dielectric Phenomena, National Academy of Sciences, Washington, D.C., 1969 (in press).

STANDARDS AND CALIBRATION

INTERNATIONAL CONFERENCE ON PRECISION MEASUREMENT AND FUNDAMENTAL CONSTANTS

The Bureau will host an International Conference on Precision Measurement and Fundamental Constants at its Gaithersburg, Md. complex August 3 to 7, 1970. The objective of the Conference is to discuss modern techniques and latest theoretical developments of precision measurement. Sponsors of the Conference include the International Union of Pure and Applied Physics, the Committee on Data for Science and Technology of the International Council of Scientific Unions, the Committee on Fundamental Constants of the U.S. National Academy of Sciences and National Research Council, the International Committee for Weights and Measures, the International Bureau of Weights and Measures, and NBS.

Among the topics to be covered are research developments in the precise measurement of the established basic standards, particularly length, time, and electric standards. The fundamental constants, for example, the velocity of light, the Rydberg constant, the proton moment, and the gravitational acceleration, also will be included in addition to associated experimental and theoretical problems. It is not the purpose of the meeting to arrive at new adjusted values of the constants, but it is expected that the substantive discussions at the Conference will help provide a basis for future adjustments.

Proceedings of the Conference will be published by NBS with papers presented in English, French, or German. Further information may be obtained by contacting: Dr. Ernest Ambler, Room A363, Building 221, National Bureau of Standards, Washington, D.C. 20234.

COAXIAL NOISE SOURCES WITH 14-mm PRECISION CONNECTORS

A service for the calibration of coaxial noise sources (generators), fitted with 14-mm precision connectors, has been announced by the NBS Engineering Division (Boulder, Colo.). Calibrations are performed at selected frequencies in the range of 2.60 to 3.95 GHz. The service is made available by the adaptation of a newly developed measurement technique to an earlier measurement system used to calibrate noise sources in WR284 waveguide.[1]

The use of coaxial connectors at frequencies above 1 GHz has brought an increasing demand for calibration of equipment fitted with precision coaxial connectors for operation at these higher radiofrequencies. Calibrated coaxial noise sources can serve as interlaboratory standards with which to calibrate other laboratory standards. The end result is the measurement of mixers, amplifiers, and receivers to determine their performance in terms of noise characteristics. Usually this is expressed as Noise Factor (or Noise Figure).[2] Knowledge of the noise characteristics of such equipment can be very useful in the design and operation of complex systems for communication, various radar applications, and for radio astronomy.

By employing coaxial-to-waveguide adapters it is possible to calibrate a coaxial noise source using a waveguide noise source which, in turn, correlates the noise output of the coaxial noise source to a known waveguide noise standard. At present the calibration service is limited to the useful range of WR284 waveguide (2.60 to 3.95 GHz).

In the transfer of noise temperature from a known value in a waveguide noise source to a coaxial noise source submitted for calibration, it is necessary to make several comparison measurements. The process requires: 1. A waveguide noise source to be measured and evaluated by comparison to a reference noise source (the NBS Reference Standard); it then has a known noise temperature and is the NBS Waveguide Working Standard. 2. This waveguide noise source is compared to a coaxial noise source using the new technique of measurement to evaluate and determine its noise temperature; this unit then is the NBS Coaxial Working Standard. 3. Other coaxial noise sources are compared, in turn, to the NBS Coaxial Working Standard. In the development of the present calibration service, the previously developed NBS Reference Standard [1, 3] in WR284 waveguide is used to provide the reference noise temperature. The noise generator of the Reference Standard consists of a block of silicon carbide imbedded in beryllium oxide and heated to about 700 kelvins. An argon-filled gas-discharge tube of the heated-filament-cathode type, contained within a mount

*The effective noise temperature, T_{ne}, is proportional to the power emerging from the output port of the coaxial noise source when it is connected to a nonreflecting load. The noise temperature, T, of the noise source (generator) is analogous to the available power from a generator and is obtained when corresponding reflection coefficients for generator and load are complex conjugates of each other (characteristic impedances being chosen real). The relationship between the noise temperature and effective noise temperature is

$$T_{ne} = T1 - |\Gamma|^2$$

where $|\Gamma|$ is the reflection coefficient magnitude of the coaxial noise source,

fitted with a precision coaxial connector, serves as an NBS Coaxial Working Standard.

Two waveguide-to-coaxial adapters are required in this technique (direction of flow of noise energy will be from waveguide to coaxial in certain transfer steps, and from coaxial to waveguide in other transfer steps). The measurement process requires the exchange of adapters on the NBS Waveguide Working Standard and on the coaxial noise source that serves as the NBS Coaxial Working Standard. Beyond this measurement, coaxial noise standards can be calibrated without resorting to the use of waveguide-to-coaxial adapters, except for the use of a waveguide-to-coaxial adapter at the waveguide input to the radiometer.

The calibrated value of a coaxial noise source is expressed in terms of the effective noise temperature,* from which the excess noise ratio** may be calculated at several selected frequencies*** and under specific operating conditions of the noise source. Calibrations are performed over a range of effective noise temperature of 700 to 300 000 kelvins, although the range can be extended somewhat beyond these limits. The approximate limits of systematic error to be anticipated are ±400 kelvins, and an approximation of the limits of random error will be ±25 kelvins, for an effective noise temperature of 11 400 kelvins. Therefore the total error should be about ±425 kelvins, which is approximately ±0.16 dB expressed in terms of the error in the excess noise ratio.

Two types of one-port devices will be accepted for calibration as coaxial noise sources: 1) a gas-discharge tube securely fitted into a mount that is terminated at the cathode end with a suitable matched load, and 2) a temperature-limited diode that is similarly mounted. Each type must be fitted with a 14-mm precision output connector. However, it has been determined that a 14-mm adapter will suffice if it is securely attached to the existing coaxial connector on the mount. Complete information on the operating current and a wiring diagram must be supplied with the device submitted for calibration.

At this time it has not been determined whether the newly developed solid-state noise sources are stable enough to be used as interlaboratory devices. However, should they prove to have the stability and consequently justify their use as interlaboratory standards, they will be accepted for calibration if submitted as one-port devices having a 14-mm output connector. Complete information on the operating conditions and wiring connections must be supplied with the device submitted for calibration.

and T_{ne} and T are in kelvins. From: Beatty, R. W., and Kerns, D. M., Basic Theory of Waveguide Junctions and Introductory Microwave Network Analysis, p. 53, Pergamon Press, 1967.

**Excess noise ratio (ENR) is defined to be

$$ENR = 10 \log_{10} \frac{T_{ne} - T_0}{T_0}$$

where T_{ne} is the effective noise temperature in kelvins and $T_0 = 290$ kelvins.

***Frequencies selected for this present calibration service are: 2.60, 2.85, 3.00, 3.25, 3.55, 3.75, and 3.95 GHz.

GEOALERT CODE CHANGED

Effective January 1, 1970, the International Ursigram and World Days Service (IUWDS) announced changes in the coding system for GEOALERTS instituted October 1, 1968.[4] There were no changes in the actual symbols broadcast, but there are minor redefinitions of the symbols in the first letter set. Letters which may occur in the first set and their meanings are as follows: [5]

EEE	(.)	No forecast (or STRATWARM observation) statement
III	(..)	SOLALERT in effect which means one or several eruptive or active centers are present on the sun
SSS	(...)	XRAYALERT or PROTONALERT is in effect
TTT	(_)	MAGSTORM expected
UUU	(.._)	SOLALERT and MAGALERT
VVV	(..._)	PROTONALERT and MAGALERT
HHH	(....)	STRATWARM observed
DDD	(_..)	STRATWARM observed and SOLALERT
BBB	(_...)	STRATWARM observed and PROTONALERT
MMM	(__)	STRATWARM observed and MAGSTORM expected

The definitions of the second and third sets of letters remain the same.

SEMINAR POSTPONED

The NBS Measurement Seminar on Length, Angle, and Geometry Measurements originally scheduled for May 11–15, 1970, has been postponed until May 1971. The seminar was described in a special insert attached to the July 1969 issue of the *NBS Technical News Bulletin.*

STANDARD FREQUENCY AND TIME BROADCASTS

High-frequency radio stations WWV (Fort Collins, Colo.) and WWVH (Maui, Hawaii) broadcast time signals on the Coordinated Universal Time (UTC) system as coordinated by the Bureau International de l'Heure (BIH), Paris, France. These NBS time signals, UTC(NBS), are maintained within 5 microseconds of the corresponding time signals of the U.S. Naval Observatory, UTC(USNO). The UTC pulses occur at intervals that are longer than one coordinate second by 300 parts in 10^{10} during 1970, due to an offset in carrier frequency coordinated by BIH. To maintain the UTC scales in close agreement with the astronomers' time, UT2, phase adjustments are made at 0000 hours Greenwich Mean Time (GMT) on the first day of a month as announced by BIH. *There will be no adjustment made on April 1, 1970.*

The low-frequency radio station WWVB (Fort Collins, Colo.) broadcasts seconds pulses without offset to make available to users the standard of frequency so that absolute frequency comparisons may be made directly, following the Stepped Atomic Time (SAT) system. Step time adjust-

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NSRDS NEWS

The NSRDS was established to make critically evaluated data in the physical sciences available to science and technology on a national basis. The NSRDS is administered and coordinated by the NBS Office of Standard Reference Data.

HIGH TEMPERATURE INORGANIC SALTS

NSRDS-NBS-30, *High Temperature Properties and Decomposition of Inorganic Salts, Part 2. Carbonates* (45 cents, SD Catalog No. C13.48:30),[1] by K. H. Stern and E.L. Weise is the most recent publication of the NSRDS critical data compilations. This volume is the second in a series devoted to the subject. Since World War II, inorganic salts, particularly in the liquid state, have assumed increasing importance in a variety of applications. They are useful as reaction media, in metallurgical processes, and in electrochemical power sources such as fuel cells and thermal batteries.

Experimentalists and theoreticians have found molten salts an interesting subject for study because these ionic fluids offer an unusual opportunity to study short-range ionic interactions in the liquid state.

So far, attention in this field has largely been focused on the alkali and alkaline earth halides as their stability at high temperatures is well known. The only decomposition that they can undergo is dissociation to the elements, the extent of which can be easily calculated from existing thermodynamic compilations.

However, for most inorganic salts the situation is more complicated. In many cases the decomposition reactions are not well defined and high-temperature thermodynamic and kinetic data are either lacking or scattered through the literature. Thus, although the study of many salts would undoubtedly prove interesting and useful, they have received little attention because in many cases not even the range of thermal stability is known.

The purpose of the present series on this subject is to alleviate this situation by publishing in concise form thermodynamic and kinetic data relevant to the high-temperature behavior of important classes of inorganic salts. For the present, data in this work are restricted to anhydrous compounds with monatomic cations and oxyanions containing one element besides oxygen. Each volume in this series will deal with compounds of one anion—in the present volume, carbonates.

Thermodynamic information has been heavily stressed because it is most important for dealing with the stability problem, and because it constitutes the bulk of what is available. Thermodynamic variables that have been included are:

a. Phase transition temperatures above 298 K, except those at high pressures, together with the corresponding enthalpies and entropies.

b. Equilibrium constants and decomposition pressures, as well as relevant free-energy functions from 298 K to as high a temperature as data exist. ΔHf and S° values of reactants and products at 298 K from which the above functions are calculated are also given.

c. Densities at 298 K and above.

Because the kinetics of carbonate decomposition have been more extensively studied than those of any other class of inorganic salts, an examination of the relevant literature has revealed many regularities and has delineated more sharply certain areas of ignorance. For example, although the ability to control all the factors determining rate constants is not yet possible, reproducible quantities can now be stated rather precisely for those conditions for which activation energies are well defined. Rather than cite the bulk of the extensive literature in this field, much of which is applicable to very special conditions, the authors have provided a brief review of carbonate decomposition kinetics in which the common features rather than the peculiarities of individual compounds are stressed. Where such peculiarities are of special interest, they are described in the appropriate section.

Specifically, NSRDS-NBS-30 provides a critical review of the literature dealing with the high temperature behavior of inorganic carbonates. Free energy functions of reactants and products of the decomposition reactions were calculated and tabulated from 298 K to, in some instances, as high as 2400 K. Free energy functions and equilibrium constants of reactions also were tabulated. Auxiliary data on phase transitions, densities, and kinetics of thermal decomposition are included and the literature of the endothermic decomposition kinetics of solids, as it applies to carbonates, has been reviewed. The publication has a selected bibliography of 133 references.

NSRDS-NBS-7, *High Temperature Properties and De-*

composition of Inorganic Salts, Part 1. Sulfates (35 cents, SD Catalog No. C13.48:7),[1] by the same authors critically reviews the literature dealing with the high temperature behavior of inorganic sulfates, and provides calculations and tabulations of the free energy functions of reactants and products of the decomposition reactions from 298 K to 1200 K. Tables of free energy functions, equilibrium constants of reactions, and partial pressures of gaseous components are included, as well as data on phase transitions, densities, and kinetics of chemical decomposition. This publication contains a selected list of 145 references.

THERMODYNAMIC PROPERTIES OF FLUIDS SYMPOSIUM

A symposium on the evaluation of the thermodynamic properties of fluids, under the auspices of the Numerical Data Advisory Board of the National Academy of Sciences—National Research Council (NAS-NRC) and the NBS Office of Standard Reference Data, was held in Warrenton, Va., on November 5-7, 1969. The symposium was planned as a technical meeting for those active or interested in the production and evaluation of data. More than 75 workers in the field from the United States and the United Kingdom attended. Organizers of the symposium were H. Van Olphen, NAS-NRC, and Howard J. White, Jr., NBS Program Manager for Thermodynamic and Transport Properties.

Speakers and subjects included: S. Angus, Director, IUPAC Thermodynamic Tables Project Centre, "World Wide Data Evaluation Efforts"; R. C. Downing, E. I. duPont de Nemours, "Industrial Needs"; J. F. Masi, U.S. Air Force, "Needs of a Government Agency"; H. M. Roder, NBS, "Fluid Properties, The Case for High Quality Evaluation"; J. M. H. Levelt Sengers, NBS, "Correlation of Thermodynamic Data in the Critical Region"; J. R. Macdonald, Texas Instruments, Inc., "Error Analysis and Model Determination"; J. H. Keenan, Massachusetts Institute of Technology, "A Single Fundamental Equation for Vapor and Liquid Water"; M. Klein, NBS, "On the Determination of the Intermolecular Function for Macroscopic Properties"; and L. M. Branscomb, NBS Director, "A Standard for Reference Data."

Discussion panels on the needs, resources, and current program were held on the following topics. The chairman of each panel is also listed. "Atmospheric Gases," V. J. Johnson, NBS; "Hydrocarbons," P. T. Eubank, Texas A&M University; "Refrigerants," J. J. Martin, University of Michigan; "Polar Gases," T. S. Storvick, University of Missouri; "Mixtures," L. N. Canjar, University of Detroit.

There are plans to publish the deliberations of the panels. Availability of this publication will be announced in the *NSRDS News* and the *Bulletin of Thermodynamics and Thermochemistry*.

CODATA BULLETIN

The *CODATA Bulletin* is an irregular publication of the International Council of Scientific Unions (ICSU) Committee on Data for Science and Technology (CODATA). *CODATA Bulletin* 1, October 1969, is the Report of the ICSU-CODATA Task Group on Computer Use entitled, Automated Information Handling in Data Centers. It reviews the status of automated procedures of data centers in the United States, the United Kingdom, France, Germany, Japan, and Canada. *CODATA Bulletin* 1 is available on request from the ICSU-CODATA Central Office, Westendstrasse 19, 6 Frankfurt/Main, Germany-BRD.

INTERNATIONAL CODATA CONFERENCE

The Second International CODATA Conference on Numerical Data for Science and Technology will be held at St. Andrews, Scotland, on September 7-11, 1970. The Conference program will include reports on current activities of CODATA task groups, reports from new data centers, computer processing and transmission of data, output of data centers, computerized and automated storage and retrieval of data (data banks) and literature in data centers; industrial data; and the role of CODATA in a worldwide information network. In addition, working groups and panels will discuss specific problems in the work of data centers and compilers.

Organization of the Conference will be similar to that of the First International CODATA Conference. Invited and selected papers will be presented, and organized panel discussions will take place in the mornings and evenings, while afternoons will be available for informal discussion groups, computer demonstration, or recreation. Attendance at the conference will be limited to about 100; the Conference language will be English.

The first notice, giving details of the program, location, registration and reservation, and application forms, is available from the CODATA Central Office, Westendstrasse 19, 6 Frankfurt/Main, Germany-BRD. Applications should be returned to: Mr. N. H. Robinson, British National Committee on Data for Science and Technology, the Royal Society, 6, Carlton House Terrace, London, S.W. 1, U.K.

CODATA TASK GROUP ON CHEMICAL KINETICS

The CODATA Task Group on Data for Chemical Kinetics has now been formed with the following membership: Chairman, Sidney W. Benson, Stanford Research Institute, Menlo Park, Calif.; Members, D. L. Baulch, The University of Leeds, Leeds, U.K.; E. T. Denisov, Institute of Chemical Physics, U.S.S.R. Academy of Sciences; J. E. Dubois, University of Paris, France; J. Durup, Laboratory of Physical Chemistry, Orsay, France; David Garvin, Director, NBS Chemical Kinetics Information Center; H. Hartmann, Institute of Physical Chemistry, University of Frankfurt, Frankfurt, Germany; K. U. Ingold, National Research Council of Canada, Ottawa; J. A. Kerr, The University of Birmingham, U.K.; Masao Koizumi, Tohoku University, Sendai, Japan; T. W. Newton, Los Alamos

Scientific Laboratory, Los Alamos, N.M.; H. G. Wagner, Institute of Physical Chemistry, University of Gottingen, Germany.

THERMOPHYSICAL PROPERTIES OF AIR

The Compilation Unit of the NBS Cryogenic Data Center conducts critical evaluations of quantitative information from the world's literature related to the thermophysical properties of materials at cryogenic temperatures. The *Bibliography of Thermophysical Properties of Air from 0 to 300 K*, by L. A. Hall, NBS Technical Note 383, Oct. 1969 ($1.25, SD Catalog No. C13.42:383),[1] is the fourth in a series on the properties of cryogenic fluids.

References and abbreviated abstracts are presented for the mechanical, thermodynamic, and transport properties of air from 0 to 300 K. A total of 610 articles, published prior to December 1968, have been indexed. Each article was reviewed and coded with regard to properties studied, type of article (experimental, theoretical, etc.), and method of data presentation. The temperature and pressure ranges for each property under consideration are also given. The bibliography is indexed according to property with subindexes for the state of the substance—solid, liquid, and gas up to 200 K, and gas above 200 K.

REPRINTS ON THE INFORMATION ANALYSIS CENTER

The Panel on Information Analysis Centers of the Committee on Scientific and Technical Information (COSATI) of the Federal Council for Science and Technology has issued a reprint packet of seven significant papers on the Information Analysis Center. Included in the packet are the following papers: "Second Thoughts on Scientific Information" by Alvin M. Weinberg; "Is the Literature Worth Retrieving?" by Samuel A. Goudsmit; "Is the Literature Worth Reviewing?" by Lewis M. Branscomb; "The Information Analysis Center and the Creation of Reliable Data" by L. J. Kieffer; "Distill or Drown: The Need for Reviews" by Conyers Herring; "Objectives of the Forum and the Activities of COSATI Panel No. 6" by E. L. Brady; and a "Summary of Problem Areas and Recommendations to COSATI." The reprint packet includes an Introduction by Andrew A. Aines, Chairman of COSATI. A very limited number of copies of this packet are available from the COSATI Panel on Information Analysis Centers, Room A521, Administration Building, National Bureau of Standards, Washington, D.C. 20234.

[1] Order by the SD Catalog number from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, for the price indicated.

CLEARINGHOUSE
FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION

Journal on Magnetic Tape

Beginning with the January 10, 1970 issue of the Clearinghouse's *U.S. Government Research and Development Reports* (USGRDR) announcement journal, magnetic tapes of the journal have been available on a subscription basis.

A magnetic tape containing information equivalent to each USGRDR is issued on the journal publication date—the 10th and 25th of each month. The annual subscription rate for 24 issues is $1500. Prepayment is required.

The USGRDR tapes will be released on 600-foot "Minireels." The subscriber may select either a 7-track tape with either 556 or 800 characters per inch (cpi) and odd parity; or a 9-track tape of 800 cpi and odd parity. Additional specifications are available upon request.

To subscribe to this new Clearinghouse service, specify the number of tracks and cpi desired, and enclose a check or money order payable to the Clearinghouse. Mail to: Clearinghouse (152.12), U.S. Department of Commerce, Springfield, Va. 22151.

For testing purposes, copies of USGRDR Volume 69, No. 13 are available at $25 per tape. Order this tape as USGRDRMT69NO13.

Back issues of the journal to January 1967 may be made available at a later date if the demand warrants.

Automotive Safety Reports

More than 200 test compliance reports on tires, seat belts, and vehicles have been issued by the National Highway Safety Board, U.S. Department of Transportation (DOT), through the Clearinghouse. The information in the documents has been extracted from tests conducted under the National Highway Safety Board's compliance testing program to determine whether or not motor vehicles and items on vehicles meet the Federal motor vehicle safety standards. The test results, however, do not reflect the NHSB's position on the matter.

The first list of test areas and results are contained in the Clearinghouse Fast Announcement FA 69–556, copies of which are available from the Clearinghouse for Federal Scientific and Technical Information (152.12), Springfield, Va. 22151. Additional reports in the National Highway Safety Bureau Compliance Testing Program will be announced in Fast Announcements, as they become available. The Fast Announcement Service is available from the Clearinghouse on an annual subscription basis for $5.

CONFERENCE *Briefs*

STANDARDS LABORATORIES CONFERENCE TO BE HOSTED

The National Conference of Standards Laboratories will hold its biennial meeting June 15-17, 1970, at the Bureau's site in Gaithersburg, Md. Theme of this year's Conference will be Innovative Metrology—Key to Progress.

NCSL is a non-profit laboratory-oriented organization founded to promote cooperative efforts toward solving the common problems faced by standards laboratories in their organization and operation. Its membership consists of academic, scientific, industrial, commercial, and governmental laboratories concerned with the measurement of physical quantities, the calibration of standards and instruments, and the development of standards of practice. It provides liaison with technical societies, trade associations, and educational institutions interested in these activities.

Topics to be discussed at the Conference include:

New ways of managing
New ways of reducing costs
New methods of optimizing calibration intervals
New time-saving procedures
New technologies and applications

One of the Conference highlights will be an address by Myron Tribus, Assistant Secretary of Commerce for Science and Technology, at the Conference Banquet. The keynote address will be given by Lewis M. Branscomb, NBS Director.

Since the original call for papers was issued, the dates for the Conference have been changed (previously announced as June 14-16). This makes possible a back-to-back arrangement with the Precision Measurements Association, whose Third Annual Conference will be held at the Sheraton Park Hotel, Washington, D.C., June 17-19. The opening session of the PMA Conference is in fact planned to be held at the Bureau in cooperation with the NCSL Conference.

For further information concerning the NCSL Conference, write to: R. J. Barra, M.S. 550, Westinghouse Defense & Space Center, P.O. Box 746, Baltimore, Md. 21203.

NBS HOSTS SILVER ANNIVERSARY OF CALORIMETRY CONFERENCE

The Bureau will sponsor and host the 25th Annual Calorimetry Conference at its Gaithersburg, Md., facility October 19-22, 1970. NBS served as host for the 7th annual Calorimetry Conference in 1952, and as co-host with the National Naval Medical Center for the 19th Annual Calorimetry Conference in 1964.

From its inception in 1946, this Conference has been a forum for the exchange of ideas, methods, and experimental results, and has promoted discussions of problems of mutual interest among calorimetrists on an informal basis. Each year since 1954, a well known calorimetrist or thermochemist is chosen to deliver the Huffman Memorial Lecture, which initiates the presentation of papers at the Conference. This lecture is named in honor of Hugh M. Huffman not only for his contributions to thermochemistry, but because of his persevering efforts in organizing the first calorimetry conferences, and his ability to foresee the benefits that would stem from these conferences.

All phases of calorimetry will be discussed including high- and low-temperature heat capacity, enthalpy, precision bomb and reaction calorimetry, solution calorimetry, microcalorimetry, biocalorimetry, and thermometry. Other related topics of interest include temperature controlling devices, temperature scales, standard calorimetric samples, automatic computation of results, data evaluation, data compilation, and publication policies. In addition to the contributed papers, invited papers and discussion groups are planned.

The Calorimetry Conference has as its chairman for 1970, G. C. Sinke (Dow Chemical Co., Midland, Mich.), and as its program chairman, E. D. West (NBS, Boulder, Colo.). E. S. Domalski (NBS, Gaithersburg, Md.) is chairman of the local arrangements committee.

For further information concerning the program of the Conference, contact: Dr. E. D. West, Division 271.05, National Bureau of Standards, Boulder, Colo. 80302.

For further information regarding local arrangements of the Conference, contact: Dr. E. S. Domalski, Division 316.01, National Bureau of Standards, Washington, D.C. 20234.

CERAMIC MACHINING AND FINISHING CONFERENCE TO MEET

The developing science of ceramic machining and surface finishing will be surveyed at a conference to be held at the Bureau in Gaithersburg, Md., November 2–4, 1970. Discussion of the current problems and research programs in this field should improve both the technology of ceramic finishing and the prediction and control of surface dependent properties. The Conference is being sponsored jointly by NBS, the Office of Naval Research, and the American Ceramic Society (Baltimore-Washington Section).

The Conference will consist of invited and contributed papers on the techniques, analysis, and effects of machining and surface finishing. The subject outline covers four general areas: 1) techniques and mechanisms of removal and shaping, including mechanical methods, energy beam and sputtering, chemical, and electrical discharge methods, 2) techniques and mechanisms of surface treatment, 3) analysis and characterization of machining and finishing effects by direct observation techniques, diffraction and related techniques, and chemical techniques, and 4) mechanical and other effects of surface finishing.

Contributed papers are being solicited. Abstracts (250–300 words) should be submitted before April 30 to the chairman, Mr. Samuel J. Schneider, Materials Building, Room B220, National Bureau of Standards, Washington, D.C. 20234.

SCHEDULED NBS-SPONSORED CONFERENCES

Each year NBS sponsors a number of conferences covering a broad range of topics in science and technology. The conferences listed below are either sponsored or cosponsored by NBS and will be held at the Bureau's Gaithersburg, Md., facility unless otherwise indicated. These conferences are open to all interested persons unless specifically noted. If no other address is given, inquiries should be sent to the person indicated below in care of Special Activities Section, Room A600, Administration Building, National Bureau of Standards, Washington, D.C. 20234.

American Society for Information Science Conference. Apr. 9–10. Cosponsor: American Society for Information Science (Washington and Baltimore Chapters). Contact: Madeline Henderson (NBS Center for Computer Sciences and Technology).

Second IEEE Transducer Conference. May 4–5. Sponsor: IEEE (Group on Industrial Electronics and Controlled Instrumentation). Contact: Paul Lederer (NBS Electronic Technology Division).

Operations Research—Users and Producers. May 7–8. Cosponsors: Institute of Management Sciences; Operations Research Society of America; Washington Operations Research Council. Contact: Lloyd Burden (NBS Technical Analysis Division).

Silicon Device Processing. June 2–3. Cosponsor: American Society for Testing and Materials (Committee F–1). Contact: C. P. Marsden (NBS Electronic Technology Division).

1970 Conference on Precision Electromagnetic Measurements. June 2–5. Cosponsors: IEEE (Group on Instrumentation and Measurement); International Scientific Radio Union (U.S. Commission 1). Contact: George Goulette, Bureau of Continuation Education, University of Colorado, Boulder, Colo. 80302. To be held at NBS in Boulder, Colo.

1970 Standards Laboratory Conference, Innovative Metrology—Key to Progress. June 15–17. Sponsor: National Conference of Standards Laboratories. Contact: H. L. Mason (NBS Institute for Basic Standards).

55th National Conference on Weights and Measures. July 12–17. Contact: H. F. Wollin (NBS Office of Weights and Measures). To be held at the Hotel Utah, Salt Lake City, Utah.

International Conference on Precision Measurement and Fundamental Constants. Aug. 3–7. Cosponsors: IUPAC; CODTA; National Academy of Sciences-National Research Council; International Bureau of Weights and Measures. Contact: E. Ambler (NBS Institute for Basic Standards).

Space Simulation Conference. Sept. 14–16. Cosponsors: American Institute of Aeronautics and Astronautics; Institute of Environmental Sciences; American Society for Testing and Materials. Contact: J. C. Richmond (NBS Heat Division).

25th Calorimetry Conference. Oct. 19–22. Contact: E. Domalski (NBS Physical Chemistry Division).

The Science of Ceramic Machining and Surface Finishing. Nov. 2–4. Cosponsors: Office of Naval Research; American Ceramic Society. Contact: S. J. Schneider (NBS Inorganic Materials Division).

Symposium on the Application of Computers to Environmental Engineering Design. Nov. 30–Dec. 2. Cosponsor: American Society of Heating, Refrigerating and Air Conditioning Engineers. Contact: R. Achenbach (NBS Building Research Division).

STANDARDS AND CALIBRATION *continued*

ments of 200 ms are made at 0000 hours GMT on the first day of a month when necessary. BIH announces when such adjustments should be made in the scale to maintain the seconds pulses within about 100 ms of UT2. *There will be an adjustment made on April 1, 1970. The seconds pulses emitted from WWVB will be retarded 200 ms.*

NBS obtains daily UT2 information from forecasts of extrapolated UT2 clock readings provided by the U.S. Naval Observatory with whom NBS maintains close cooperation.

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[2] Miller, C. K. S., Daywitt, W. C., and Arthur, M. G., Noise standards, measurements, and receiver noise definitions, Proc. IEEE, 55 (6), 865–877 (June 1967), see topic of "Noise Factor," pp. 874–875.

[3] Calibration of microwave noise sources, Nat. Bur. Stand. (U.S.), Tech. News Bull. 47 (2) 31–34 (Feb. 1963).

[4] GEOALERT code modified, Standards and Calibration, Nat. Bur. Stand. (U.S.), Tech. News Bull. 52 (11) 252 (Nov. 1968).

[5] The International Morse code symbols in parentheses are given for single letters only; i.e., E is one dot, EEE would be three dots separated by the appropriate intervals.

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PERIODICALS

Technical News Bulletin, Annual Subscription: Domestic, $3; foreign, $4. Single copy price 30 cents. Available on a 1-, 2-, or 3-year subscription basis. SD Catalog No. C13.13:54.

Journal of Research of the National Bureau of Standards

Section A. Physics and Chemistry. Issued six times a year. Annual subscription: Domestic, $9.50; foreign, $11.75. Single copy price varies. SD Catalog No. C13.22/sec. A: 74.

Section B. Mathematical Sciences. Issued quarterly. Annual subscription: Domestic, $5; foreign, $6.25. Single copy, $1.25. SD Catalog No. C13.22/sec. B: 74.

Section C. Engineering and Instrumentation. Issued quarterly. Annual subscription: Domestic, $5; foreign, $6.25. Single copy, $1.25. SD Catalog No. C13.22/sec. C:74.

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